The Impact of Capital Accumulation on Forestry Production Output in Nigeria

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Abstract
This study was aimed at investigating the impact of capital accumulation on forestry production output in Nigeria. The study covered a period of 1980-2013. The objective is; to examine the impact of capital accumulation (Net National Savings(NNS), Gross Capital Formation(GCF), Human Capital Formation(HCF)) on forestry production output in Nigeria. The study employed the Ordinary Least Squares (OLS) and the Co-integration/Error Correction method (ECM) as the main analytical tools. The Forestry production output model was developed. The Forestry Production Output model results revealed that the coefficient of ECM appeared with the right sign but statistically not significant at the 5% level. Durbin Watson value of 1.88 suggests a lesser level of autocorrelation. The overall fit was satisfactory with an R-squared of 0.53. The F-statistic of 6.977 was significant at the 5% level. The result showed that all the variables used in the model had positive impact on forestry production output but the impacts was not significant hence, the null hypotheses were accepted which states that capital accumulation (NNS, GCF, HCF) does not significantly affect forestry production output in Nigeria. The results showed that capital accumulation has positive implications for forestry production output in Nigeria. The government should increase funding and encourage investment in human capital development especially in education, health, research and development. This will ensure that the requisite manpower needs in the forestry sector will be available. Government policies on capital Investment in the forestry sector should be increased and monitored to ensure that the target groups use the funds for the development of the forestry sector.

Keywords: *Capital, Accumulation, Production, Forestry, Output*

Introduction

Improving the production capacity of agriculture in developing countries through productivity increases is an important policy goal where agriculture represents an important sector in the economy. Agriculture comprises the main fields of human activity concerning the primary production of food and cash crops, livestock, fishing, forestry and marketing of the products. The Nigerian economy during the first decade after independence could be described as an agrarian economy because agriculture served as the engine of growth of the overall economy (Ogen, 2003). From the stand point of occupational distribution and contribution to GDP, agriculture was the leading sector. In the early 60's, contribution from this sector accounted for about 70% of the Gross Domestic Product (GDP). This was a period when we were not only virtually self-sufficient in production of food crops to feed ourselves but also provided raw materials for industries and major crops for export (Ekerete, 2000). Indeed, agriculture provided the main stimulus to our national economic growth despite the small farm holdings and primitive productive systems. The role of agriculture in any economy is very well articulated in the relevant literature. Therefore, agriculture contributes greatly to government revenue, employment and the general economic performance – the higher the agricultural output, the higher will be the overall expenditure, savings and, ultimately, investment in the economy. Consequently, any activity that will boost agriculture will be expected to result in increased savings and investment. This will, in the long run, stimulate economic growth and reduce poverty. Unfortunately, Nigeria's agricultural sector suffers from extremely low productivity, largely due to its peasant nature. The sector has also suffered from unstable and often inappropriate economic policies (of pricing, trade and exchange rate), the relative neglect of the sector, the negative impact of oil boom era (NBS, 2014), a land tenure system that does not encourage long-term investment in technology or modern production methods and a severe shortage of rural credit (FAO, 2006). Given the central role of agriculture in Nigeria's economy, this situation does not augur well for savings and investment. So, the need for agricultural growth–driven government policy is inevitable for sustained economic growth in Nigeria. There is growing concern among researchers and policy makers over the declining trend in saving rates and its substantial divergence among countries. This is due to the critical importance of savings for the maintenance of strong and sustainable growth in the world economy.

The crucial role of capital in economic growth and development process has been recognized since the pre Keynesian era when the classical ideology monopolized economic thinking and policy formulation. Without doubt every nation in the world today still lays tremendous emphasis on capital accumulation by stressing the need for raising the level of investment in relation to output. This emphasis is traceable to the short term fiscal policies and national development plans of both the developed and the developing economies over the Past four decades. One important trend in development process which has remained consistent since civilization is that all developed nations are industrialized. Industrialization is associated with heavy investment financed through capital accumulation.

Capital accumulation as a component of economic growth and development in any society is the process of acquiring additional capital stock which is used in productive process. The foundation of capital accumulation is savings and it results when some portion of present income is saved and invested in order to augment future output and incomes. The extent to which the level of savings can affect capital accumulation and growth largely depends on the capacity of the economy to channel the savings into productive use. Higher savings then implies higher capital

accumulation and hence, growth in the agricultural sector of the economy and in indeed the general economy. Many attempts are being made on a regular basis to study the relationship between capital accumulation and economic growth in less developing countries like Nigeria. It is believed that the people of LDCs are incapable of high level of individual savings for reasons like; low level of per capital income, indulgence in luxurious and conspicuous consumption by the few who could afford to save. According to Sims (2004), it may seem that given higher level of savings and investment, the capital stock will grow faster and a higher growth of income will result.

Statement of the Problem

Inadequate funding of the agricultural sector has been re-echoed by several experts as an obstacle to increased agricultural output (CBN 2007). However, from a nominal point of view, it is evident that in Nigeria, government spending on agriculture continues to increase over the years while empirical evidence have revealed that the performance of the agricultural sector has been inadequate (CBN, 2000). Two decades ago, Nigeria policy makers pursued a structural adjustment programme which shifted emphasis from the public sectors to the private sector. The goal was to encourage private domestic savings, private domestic investment and capital formation in order to enhance economic growth. In an attempt to achieve this goal, resources were diverted from current consumption and were invested in capital formation through privatization and commercialization of state enterprises. Unfortunately, the initial optimism expressed about public sector reforms has not been met. The growing demand for food in both rural and urban areas requires that agricultural productivity must increase. However, population growth and pressure in Nigeria have affected the supply of productive land negatively in the country (Nwagbo and Achoja, 2001).

A trend analysis of the ratio of total savings to GDP in Nigeria showed that the saving rate has been fluctuating over time. The savings/GDP ratio was 2% in 1960. It increased to 7.8% and 11.6% in 1970 and 1980, respectively. In 1990 and 2000, it declined to 11.1% and 8.4% respectively. In 2011, the savings/GDP ratio in Nigeria stood at17.4% (CBN, 2011). Clearly, the relatively poor rates at which domestic savings in Nigeria is growing is a source of worry to agricultural growth and production in Nigeria. Investment is also of a special interest as a limiting factor to agricultural production capacity and production because an alarming trend is being observed: public and private investment in agriculture has been declining (FAO 2006). Meanwhile, Agriculture sector contribution to GDP fell from 48 per cent in 1970 to 20.6 per cent in 1980 and was only 23.3 per cent of GDP in 2005. With much focus on oil sector, the average contribution of agricultural sector output to GDP is about 13 percent (CBN, 2007; Obayori, 2014). Also, when agricultural production continued to be denied of the requisite manpower and the expected gross public and private investment, its productive capacity has continued to fall short of domestic consumption and as a major source of export earnings for the country. Therefore, growth in the various sectors of the economy like the agricultural sector and indeed the general economy is slowed down and economic activities neglected. The decline in public investment is of particular concern because public investment in basic infrastructure, human capital formation and research and development (R&D) are also necessary conditions for private investment in the agricultural sector. It is based on the above that answers would be provided to the following research questions. What are the impacts of gross domestic investments on forestry production in Nigeria? What are the impacts of gross national savings on forestry

production in Nigeria? and does human capital formation have effects on forestry production output in Nigeria?

LITERATURE REVIEW

The forest products industry in Nigeria was one of the most developed within the Nigerian economy in the 1960's to early 1970's. During this period, export of wood products and agricultural commodities provided more than 70% of the country's Gross Domestic Product (GDP). As far back as 1899, the perspective planning for economic development was to exploit forest resources (Adeyoju, 1975). The export revenue from forestry grows at 4.1%, 8.0% and 28.8% between 1950-60, 1960-70 and 1970-80 respectively (Aribisala, 1993). The resources served as engine of growth and propelled economic activities in Nigeria as far back as 1792 when pit sawing operation commenced followed by the establishment of a power sawmill in Delta area of the country in 1902 (Aribisala, 1993). These developments led to substantial increase in wood exploitation for utilization in domestic industries and for export. Wood export peaked in 1950's with log and sawn wood and subsequently, veneer and plywood. This trend was maintained and sustained in the 1960's and 1970's. Between 1960-early 1970's, Nigeria witnessed establishment of large scale wood processing companies such as African Timber and Plywood, Sapele ; Epe Plywood, Epe; Nigeria Romania Wood Industry Ondo, and a host of others. Most of the companies were established on bilateral and multilateral basis and were equipped with state of art facilities (Ogunwusi, 2011). This promoted the growth of the economy through the supply of raw materials for the construction, furniture and packaging industries. It also made Nigeria an exporter of wood products such as plywood, particle boards, furniture, etc (Ogunsanwo, 2010).

The forestry sub-sector compared to the fisheries sub-sector performs a little better in its contribution to agricultural GDP and overall development of the agricultural sector in Nigeria. The sub-sector faces two main challenges to its growth which are; (i) A Low proportion of rainforest suitable for trees to grow relative to the total land mass of the country, only about 11 percent of the total land mass in Nigeria is earmarked as public forest estate out of which 26 percent is in the high forest area and the gregarious exploitation of round logs for export until its ban in 1976 during the oil glut era (Ogunwusi, 2012).This over exploitation of the wood resources has impacted negatively on the development of the forest products industry. Historically, the forest products industry in Nigeria was one of the most developed within the Nigerian economy in the 1960's to the early 1970's. During this period, export of wood products and agricultural commodities provided more than 70 percent of the country's GDP. However, these challenges coupled with several other factors such as aging of equipment resulted in the dwindling fortune of the country's forest industry (Ogunwusi, 2012).

Capital Accumulation

According to Lawanson (2009) Capital accumulation or formation refers to the process of amassing or stocking of assets of value, the increase in wealth or the creation of further wealth. Capital formation can be differentiated from savings because accumulation deals with the increase in stock of needed real investments and not all savings are necessarily invested. Recent literature has confused investment with capital formation. Investment can be in financial assets, human (capital) development, real assets that can be productive or unproductive. The increase in investment through non-financial assets has been held to increase value to the economy and the

increase in the gross domestic product through further increase in employment (Adekunle and Aderemi, 2012). The Central Bank of Nigeria (2007), defines capital formation as the total change in the value of fixed assets in the economy in addition to fixed assets either for replacing or adding to the stocks, it refers to the increase in the fixed capital stocks of the capital formed. Governments by their autonomous investment influence the direction of other investment by crowding in other investment as desired.

National Savings

National Savings thus represents resources available to government and businesses for investment in infrastructure, purchase of capital goods, human capital growth among other uses. Higher savings and investment in a nation's capital stock contribute to increased productivity and stronger economic growth and sectoral growth like forestry over long term. That is, savings today increases a nation's capacity to produce goods and services in the future. Production often brings about an increase in income either of individuals (businesses) or government and invariably a corresponding propensity to save from the additional income. Gollin (2002) defined savings as the residue of income of a government, a firm or a household after all their expenditures have been incurred. In national accounts terminology, savings is the net surplus of income over consumption or, stated differently, the amount of resources or income produced in the economy in a given period that is not consumed immediately but put to use in a way that will provide returns to the economy in future (Bakare, 2009). Saving, therefore, means forgoing consumption today so as to enjoy a better standard of living in the future while national saving, on the other hand, is the sum of saving by households, businesses, and all levels of government.

Concept of Human Capital and Human Capital Formation

According to Ajie (2008) Human Capital is the skill, knowledge or abilities acquired by labour or a stock of assets in a country which allows an individual to receive a flow of income, which could be likened to interest earned in physical capital (Ajao and Gabriel, 2011). Income of individuals is a function of human capital possessed by the workforce (Yesufu, 2000). From the view point of job performance, there may be substitution or complementary relationship between experience and training or education (Ogbuagu and Ewubare, 2014). Human Capital is a widely used concept with varying definitions which is sometimes taken to include only schooling (i.e. acquired formal education). In other circumstances, it is defined as wide set of investment that influences well-being and productivity of people, firms and nations like investments in health and nutrition, as well as vocational training (Akpokoje, 1998). Human Capital Formation on the other hand, is the process of acquiring and increasing the number of persons who have the skills, education and experience which are critical for the economic and political development of a country (Yesufu, 2000). Human Capital Formation is associated with investment in man and his development as a creative and productive person. There are different ways of acquiring and developing human capital. These various ways called human capital investment include investment in education, training, health promotion, as well as "investment in all social services that could influence man's productive capacities especially transport and housing (Okojie, 1995). Education is identified in most human capital studies as the most important component of human capital.

Gross Fixed Capital Formation

According to Ajie and Ewubare (2013) Gross Fixed Capital Formation can be classified into gross private domestic investment and gross public domestic investment. The gross public investment includes investment by government and public enterprises. Gross domestic investment is equivalent to gross fixed capital formation plus net changes in the level of inventories. Economic theories have shown that capital formation plays a crucial role in the models of sectoral growth in particular and economic growth in general. It is clear that even mildly robust growth rates can be sustained over long periods only when countries are able to maintain capital formation at a sizeable proportion of GDP
This phenomenon justifies the strong linkage between capital formation and economic growth. In order to trace the linkage between the capital formation and growth, the gross capital formation of each year is normally scaled to the gross domestic product (GDP). Thus, fluctuations in capital formation is said to have considerable effect on economic growth. However, the proportion of capital formation to GDP that can sustain a robust economic growth must not be less than 27 percent and in some cases, it must go as high as 37 percent. The public sector reforms were expected to ensure that interest rates were positive in real terms and to encourage savings, thereby ensuring that investment funds would be readily available to the real sector. Besides this, the reforms were expected to lead to efficiency and productivity of labor; efficient utilization of economic resources, increase aggregate supply, reduces unemployment and generate low inflation rate. The decline in capital formation can be as a result of macro-economic imbalances such as deteriorating foreign exchange rate and corruption in public sector. The inadequacy in economic infrastructure such as poor power supply, bad road network as well as poor health facilities were equally responsible for the decline in capital formation over time.

Ajao and Gabriel (2011) in his study concludes that long-term capital formation in Nigeria were not majorly sourced from the capital market as the above result shows the marginal contribution of Market Capitalization and New Issues to Gross Fixed Capital Formation. Though, it is unarguable that when investors take position for profit, it can affect the level of wealth which can then be used to build private capital. This result is in line with the findings of Gollin (2002) where he concludes that there exist no meaningful relationship between stock market capitalization and gross fixed capital formation. Orji and Mba (2010) in their study looked at relationship between FPI, Capital Formation and Growth, in Nigeria using the two-stage least squares (2SLS) method of estimation. The study finds that the long run impact of capital formation and foreign private investment on economic growth is larger than their short-run impact. There is thus, a long-run equilibrium relationship among the variables as the error correction term is significant, but the speed of adjustment is small in both models. In their result, the two stage least squares estimates are very close to the OLS estimates suggesting that OLS estimates are consistent and unbiased. Hence, endogeneity was not a problem in the estimated models. There is therefore no simultaneity between GDP growth and capital formation model.

Adekunle and Aderemi (2012) examined the relationship between Domestic Investment, Capital Formation and Growth in Nigeria. He used Secondary data from the Central Bank of Nigerian, for capacity utilization, capital expenditure, bank credit and capital formation while growth and investment rates from World Economic Information database were also used. His result shows that the rate of investment does not assist the rate of growth of per capital GDP in Nigeria. The study tests on the curve estimation regression models confirm that growth is in existence but is

found to be insignificant. The linear result indicates the importance of government expenditure, capacity utilization and bank credit in increasing the income of Nigerians.

With the curve estimation method results, investment rate can engender growth in the economy though slowly, on a linear path. With the accumulation of foreign capital inflows, the domestic resources of any economy are augmented thereby enhancing economic development. For capital-scarce developing countries like Nigeria, offshore capital inflows are desirable as they help to stimulate investment, employment and growth. A high inflow of foreign private investment would lead to rise in gross domestic investment, which will in turn lead to growth (Akramov, 2009). This makes FDI to be one of the major adoptions to bolster funds, investment, and development into an economy especially the agricultural sector.

This study is unique in its form. This is because no study from empirical studies disaggregated capital accumulation into Net National Savings, Gross Fixed Capital Formation and Human Capital Formation as explanatory variables to determine variations in forestry productivity as a component of total economic growth in Nigeria. Also, this study seeks to determine both the short and long run impact of capital accumulation on forestry production in Nigeria using OLS and co-integration/ECM methods. Also, the time frame of the current work is extended to 2013 to capture the resent reality in the Nigerian economy. These are the gaps the study identified to be filled.

METHODOLOGY

Research Design

The research design employed for this study is quasi-experimental and explanatory in nature. The ordinary least squares regression analysis (OLS) and the co-integration/error correction mechanism were employed as the main analytical tools. The Ordinary Least Squares was adopted because of its desirable properties of best, linear, unbiased estimates (BLUE). The co-integration technique was employed to determine the long run equilibrium relationship between the variables in the models developed as well as establish the speed of adjustment of short run dynamics to long run equilibrium.

Model Specification

Both linear and non linear specifications were tried on the argument on equations

The specifications are as follows:

Model : Forestry Production Output Model

$$FOP = f(NNS, GCF, HCF) \quad (1)$$

$$FOP_t = C_0 + C_1 NNS_t + C_2 GCF_t + Ca_3 HCF + U_t \quad \text{(Linear)} \quad (2)$$

$$LogFOP_t = LogC_0 + LogC_1 NNS_t + LogC_2 GCF_t + LogC_3 HCF + U_t \quad \text{(Non linear)} \quad (3)$$

Where:

c_0 = Intercept Parameter

c_1-c_3 = slopes Parameter

FOP = Output of Forestry Production
NNS = Net national savings
GCF= Gross capital formation
HCF= Human capital formation
All at time t.

***A priori* expectations**

On the apriori; $c_1 > 0$, $c_2 > 0$ and $c_3 > 0$

Variables in the Model

Dependent Variables

Output of Forestry Production: Forestry involves the work or business of felling and trimming trees and transporting the logs to mill. Thus, forestry production output entails the sum of price-weighted quantities of different forestry commodities produced in a year.

Independent Variables: are Net National Savings, Gross Capital Formation and Human Capital Formation

Data Collection Methods and Sources

The data for this study was time series data at the macro level spanning from 1980 to 2013. The data were largely sourced from National Bureau of Statistics Bulletin, Federal Ministry of Agriculture annual issues and Central Bank of Nigeria (CBN) statistical bulletin. The data include Forestry Production output as dependent Variable and Capital Accumulation as disaggregated into Net National Savings, Gross Fixed Capital Formation and Human Capital Formation as independent variables.

Techniques of Data Analysis

The statistical tool to be employed in analyzing the data of this study are; Ordinary Least Square method (OLS), the Error Correction Method of Co-integration based on Engle-Granger (1987) co-integration theorem and the Granger Causality test. The choice of these econometric approaches is premised on the fact that time series data are sometimes pronged to fluctuation that may cumulate into spurious regression result.

Ordinary Least Squares Regression Analysis

This test is employed to investigate the relationship that exists between the dependent and independent variables. The OLS method is chosen because of the considerable advantages associated with it (Wallace and Silver, 1988). These advantages include; Best Linear Unbiasedness (BLU), minimum variable, efficiency, least mean square (MSE) and sufficiency.

Unit Root Tests

The first stage of co-integrated technique is the unit root test, otherwise called test of stationarity. A test of stationarity which has become widely popular over the past several years is the unit root test (Gujarati, 2007). The assumption of stationarity of regressors and regressands is crucial for the properties of the OLS estimators. In this case, the usual statistical results for the linear regression model and consistency of estimators hold. But when variables are non-stationary, then

the usual statistical results may not hold. Also Granger (1986) opined that most time series variables are non-stationary and using non-stationary variable in model might lead to spurious regression. Therefore a preliminary investigation into the analysis commenced with confirmation of the order of integration of the series, where the series is confirmed to be order 1, then, co-integration can then be performed. Time series analysis involving stochastic trends, Augmented Dickey-Fuller unit root tests was calculated for individual series to provide evidence as to whether the variables are integrated. This was followed by a co-integration analysis. Augmented Dickey-Fuller (ADF) test involved the estimation of one of the following equations respectively: The unit root model is presented thus:

$$\Delta Y_1 = \alpha Y_{t-1} + \sum_{i=1}^{n} \beta \Delta Y_{t-1} + \delta + Y_{1+} \varepsilon_1 \quad (3.4) \quad \text{for levels}$$

$$\Delta\Delta Y_1 = \alpha \Delta Y_{t-1} + \sum_{i=1}^{n} \beta \Delta\Delta Y_{t-1} + \delta + Y_1 + \varepsilon_1 \quad (3.5) \quad \text{for first difference}$$

The Co-integration Technique

The study adopted the co-integration estimation technique in analyzing our data. Co-integration is an econometric technique used for testing the correlation between non-stationary time series data. Usually time series data are non-stationary due to fluctuations that do characterize such information. Two variables are said to be co-integrated if they have a long run or equilibrium relationship between them or share a common stochastic drift (Gujarati, 2007). Hence co-integration technique has been developed to address the problem of spurious correlation often associated with some time series data.

According to Charemza and Headman (1992), a stochastic process is said to be stationary if the joint and conditional probability distributions of the processes are unchanged if displaced in time. If the series are co-integrated of the same order, a linear relationship between these variables can be estimated, and examining the order of this linear relationship can test for co-integration. The grim fact is that economists look for the presence of stationary co-integrated relationships, since only these can be used to describe long-run stable equilibrium. The Granger representation theorem states that if set variables are co-integrated (1, 1); implying that the residual is co-integrated of 1(0), then there exists an error correction model describing the relationship. However, an extension of this in the co-integration technique is the error correction mechanism (ECM) (Engle and Granger, 1987). These authors have established that co-integration is a sufficient condition for an error correction model formulation.

Johansen's Test for Co-Integration: The basic argument of Johansen's procedure is that the rank of matrix of variables can be used to determine whether or not the two variables are co-integrated.

Suppose two variables X (human capital formation) and Y(net national savings), used in our analysis are integrated of order 1 and we are interested in finding out the equilibrium relationship between the two variables, then this method suggests a straight forward test whether two variables are co-integrated of order l(I) or not.

The Error Correction Model (ECM)

According to Iyoha and Ekanem (2011), error correction model (ECM) involves using lagged residual to correct for deviations of actual values from the long-run equilibrium. The error correction model (ECMs) parameter λ, which shall be negative, in general measured the speed of adjustment towards the long run equilibrium relationship between the variables.). The Error Correction Method is used to correct the inconsistencies in time series data for this study as well as provide short-run and long-run relationship amongst the variables.

Other Tests

Also tested in this research work are the following:

- Test for the co-efficient of determination (R^2) as test to know the explanatory power of the variables in the models (goodness of fit of the variables).
- Test of significance (T-test) of each of the parameter estimates.
- Overall significance (F-test) of the explanatory variables in the model.
- Durbin Watson test for serial autocorrelation.

RESULTS AND DISCUSSION

Table 1 Forestry Output, Net National Savings, Gross Fixed Capital Formation and Human Capital Formation, 1980-2013 (in million naira)

YEAR	FOP	NNS	GCF	HCF
1980	81.85000	5769.900	10841.20	1852.300
1981	81.85000	6562.600	12215.00	1232.800
1982	81.23000	7514.400	10922.00	1421.100
1983	76.08000	9443.900	8135.000	1247.000
1984	76.85000	10988.10	5417.000	1051.400
1985	79.08000	12521.80	5573.000	1073.700
1986	81.54000	13934.10	7323.000	1455.200
1987	91.19000	18676.30	10661.10	889.9000
1988	93.10000	23249.00	12383.70	1527.300
1989	96.18000	23801.30	18414.10	2394.400
1990	100.0000	29651.20	30626.80	2952.400
1991	102.0100	37738.20	35423.90	2311.700
1992	104.3400	55116.80	58640.30	10683.60
1993	106.5000	85027.90	80948.10	13311.60
1994	109.2400	108460.5	85021.90	17580.20
1995	109.3400	108490.3	114476.3	20412.70
1996	112.2400	134503.2	172105.7	21747.00
1997	113.3200	177648.7	205553.2	38705.60
1998	114.0400	200065.1	192984.4	47743.80
1999	116.3200	277667.5	175735.8	85749.90
2000	118.1100	385190.9	268894.5	104396.1
2001	120.4000	488045.4	371897.9	172626.4
2002	121.3000	592094.0	438114.9	119121.6
2003	123.1000	655739.7	429230.0	153555.3
2004	125.7000	797517.2	456970.0	191720.9

2005	132.6000	1316957.	472140.4	270803.7
2006	150.9000	1739637.	479243.6	308171.8
2007	143.2200	2693554.	492421.2	256898.8
2008	142.2400	4118173.	512438.4	278624.7
2009	145.4500	5763511.	494701.1	281231.8
2010	143.6400	5954261.	499853.5	272251.7
2011	143.7800	6531913.	502331.0	277369.4
2012	144.2900	6083228.	498961.9	276951.0
2013	143.9000	6189801.	500382.1	

Source: *CBN Statistical Bulletin (Various Issues)*

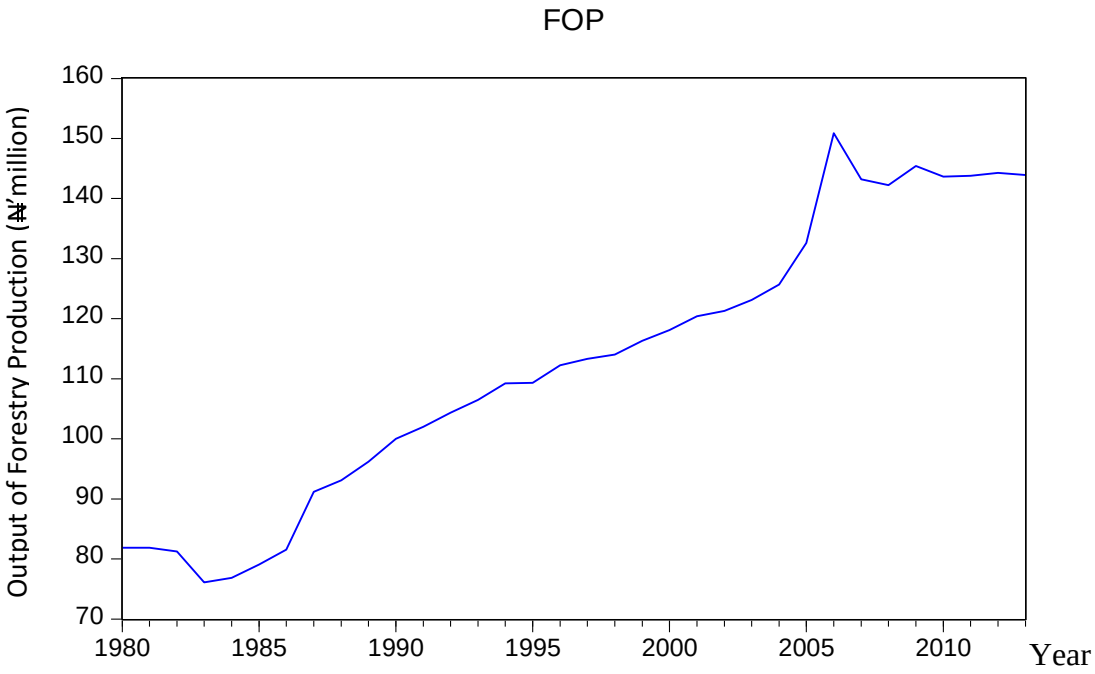

Figure 1 Trend of Output of Forestry Production

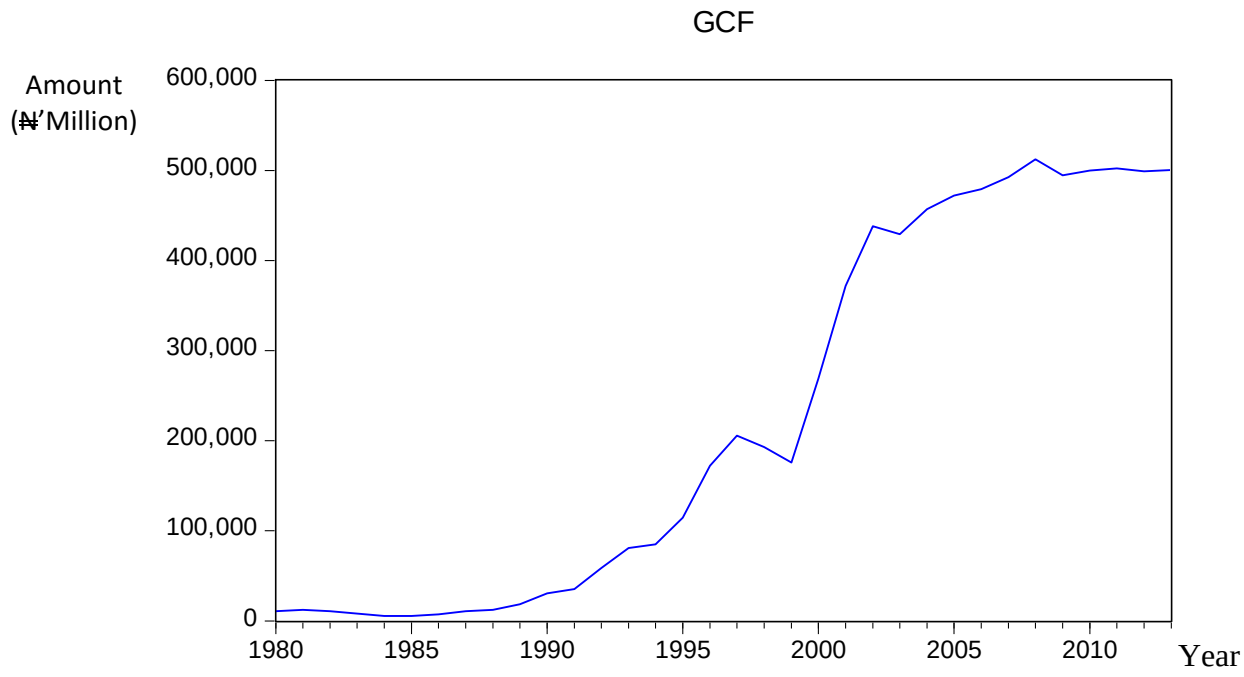

Figure 2 Trend of Gross Capital Formation

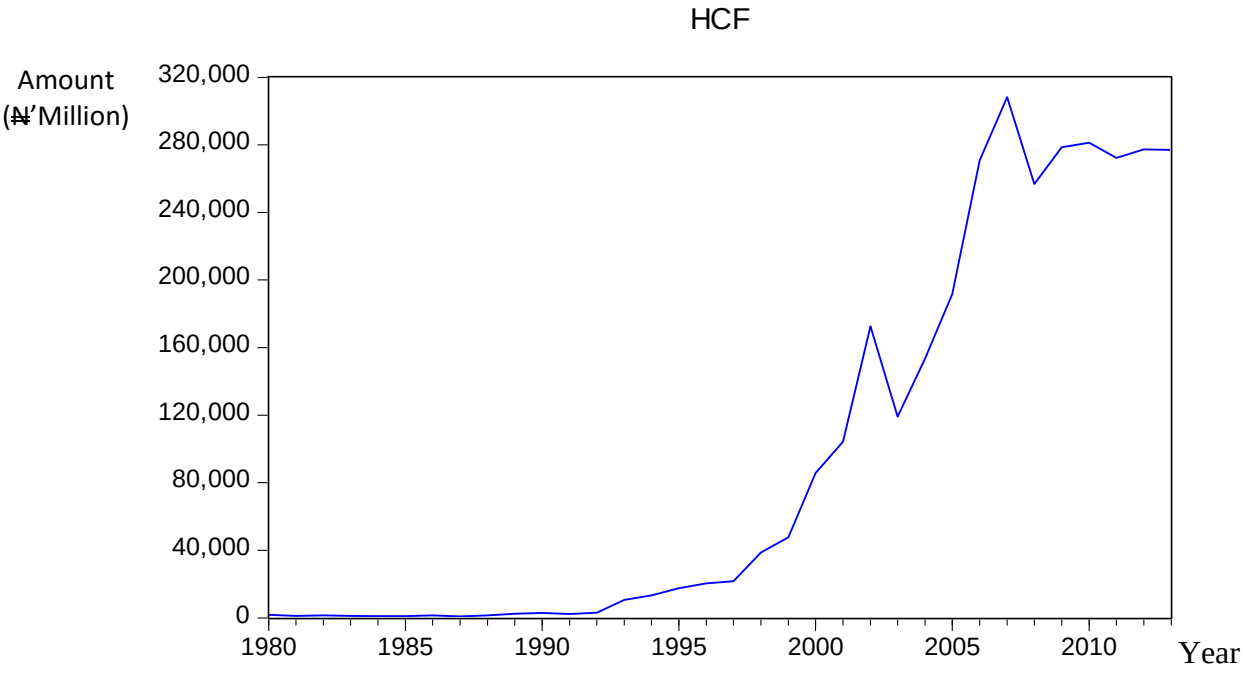

Figure 3 Trend of Human Capital Formation

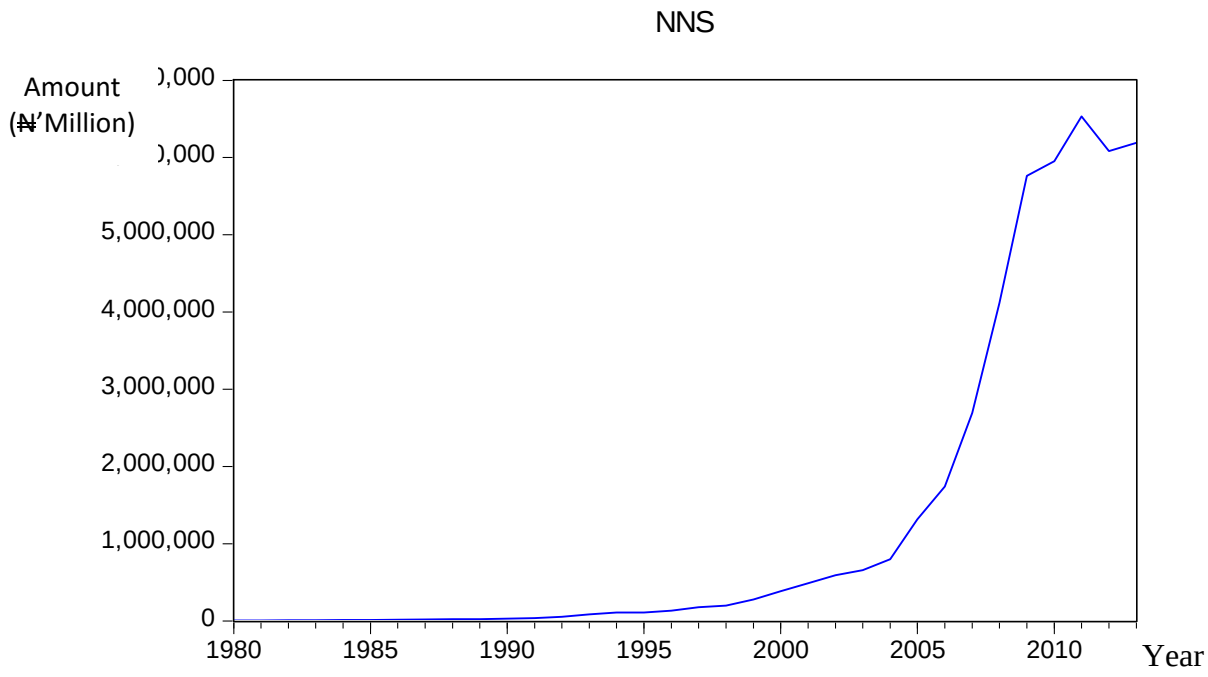

Figure 4 Trend of Net National Savings

Regression Analysis at Levels

Regression Analysis for Forestry Production Output (FOP) Model

The results below show the log-linear specifications of the forestry production output model.

Table 2: Regression Result for Forestry Production Output Model

Dependent Variable: LOG(FOP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.271050	0.080846	40.46002	0.0000
LOG(NNS)	0.073015	0.010998	6.638680	0.0000
LOG(GCF)	0.087932	0.016858	5.216035	0.0000
LOG(HCF)	-0.046332	0.017489	-2.649296	0.0127
R-squared	0.973220	Mean dependent var		4.700962
Adjusted R-squared	0.970542	S.D. dependent var		0.215023
S.E. of regression	0.036905	Akaike info criterion		-3.650812
Sum squared resid	0.040859	Schwarz criterion		-3.471240
Log likelihood	66.06380	Hannan-Quinn criter.		-3.589573
F-statistic	363.4157	Durbin-Watson stat		0.958511
Prob(F-statistic)	0.000000			

Source: *Computed Result from (E-View 7.1)*

The result of table 4.2c shows that the coefficient of determination R^2 is 97 percent. Hence, the explanatory power of the model is 97 percent. The Durbin-Watson value of 0.96 depicts the presence of serial auto correlation and this indicates that the regression result is spurious. Therefore, there is need to conduct stationarity test and long run analysis.

Co-integration and Error Correction Mechanism

Table 3: Result of Unit Root (Stationarity) Test on Variables (1980-2013)

Variables	ADF Test	Critical Value			Order of integration
		1% critical value critical value	5% Critical value	10%	
FOP	-5.538989	-3.653730	-2.957110	-2.617434	I(1)= 1st Diff.
NNS	4.790816	-3.711457	-2.981038	-2.629906	I(0)=At Level.
GCF	-4.068590	-3.661661	-2.960411	-2.619160	I(1)= 1st Diff.
HCF	-5.765974	-3.653730	-2.957110	-2.617434	I(1)= 1st Diff.

Source: *Computed Result (E-view 7.1)*

Johansen Test for Co-integration

Co-integration is conducted based on the test proposed by Johansen. According to Iyoha and Ekanem, (2002) co-integration deals with the methodology of modeling non-stationary time series variables. For detail result of the Johansen co-integration, see the table 4.4 below.

Table 4: Johansen Co-integration Test Result for FOP Model

Eigen value	Max-Eigen Statistic	5% critical value	Prob. **	Hypothesized N0 of CE(s)
0.863843	61.81228	27.58434	0.0000	None *
0.533917	23.66517	21.13162	0.0215	At most 1 *
0.174729	5.95333	14.26460	0.6192	At most 2
0.016358	0.511292	3.841466	0.4746	At most 3

Source: *Computed Result (E-view 7.1)*

Note: * denote rejection of the hypothesis at the 0.05 level. **Mackinnon-Haug-Michelis (1999) p-values. Max-eigen value test indicate 2 co-integrating eqn(s) at 0.05 level

Error Correction Model (ECM)

Error correction model (ECM) is a means of integrating the short-run behaviour of an economic variable with its long-run behaviour (Gujarati and Sangeetha, 2008). One implication of Granger representation theorem is that if two variables are co-integrated, an Error Correction Term (ECT) is required to be included (Granger, 1988). The table below shows an inference error correction test conducted:

Table 5: Over Parameterized Error Correction Mechanism for FOP Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.479257	1.455535	2.390362	0.0327
D(FOP(-1))	-0.249440	0.254720	-0.979269	0.3453

D(FOP(-2))	-0.075844	0.262500	-0.288930	0.7772
D(FOP(-3))	0.095021	0.285778	0.332499	0.7448
D(NNS)	2.16E-06	8.18E-06	0.263958	0.7960
D(NNS(-1))	6.84E-06	3.43E-06	1.995916	0.0673
D(NNS(-2))	-7.30E-06	5.90E-06	-1.236451	0.2382
D(NNS(-3))	-7.78E-07	4.64E-06	-0.167427	0.8696
D(GCF)	-4.57E-05	5.55E-05	-0.822827	0.4254
D(GCF(-1))	5.81E-05	5.21E-05	1.115753	0.2847
D(GCF(-2))	-5.32E-05	7.22E-05	-0.736866	0.4743
D(GCF(-3))	6.68E-05	3.95E-05	1.692750	0.1143
D(HCF)	6.04E-05	5.11E-05	1.181876	0.2584
D(HCF(-1))	-5.29E-06	4.87E-05	-0.108742	0.9151
D(HCF(-2))	-4.55E-05	7.67E-05	-0.592865	0.5634
D(HCF(-3))	-0.000140	5.92E-05	-2.370350	0.0339
ECM(-1)	-1.672026	6.307534	-0.265084	0.7951
R-squared	0.645832	Mean dependent var		2.260667
Adjusted R-squared	0.209934	S.D. dependent var		4.118113
S.E. of regression	3.660413	Akaike info criterion		5.730114
Sum squared resid	174.1821	Schwarz criterion		6.524126
Log likelihood	-68.95171	Hannan-Quinn criter.		5.984125
F-statistic	1.481611	Durbin-Watson stat		1.472083
Prob(F-statistic)	0.240024			

Source: *Computed Result (E-view 7.1)*

Table 5 above showed the results of the over-parameterized error correction model FOP model. The reason for the over-parameterized specification is to show the main dynamic processes in the model and as well sets the lag length such that the dynamic processes would not be constrained by too long a lag length.

The over-parameterized is the transform in order to achieve the parsimonious ECM to make it more interpretable for policy implementation. The parsimonious error correction result is presented in table 6 below.

Table 6: Parsimonious Error Correction Model for FOP Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.560299	1.453304	2.449797	0.0242
D(FOP(-1))	-0.185173	0.210697	-0.878859	0.3905
D(FOP(-2))	-0.252882	0.218409	-1.157836	0.2613
D(FOP(-3))	0.199349	0.219518	0.908122	0.3752
D(NNS(-1))	3.66E-06	2.63E-06	1.392827	0.1798
D(NNS(-3))	-4.54E-06	2.41E-06	-1.882089	0.0752
D(GCF(-1))	-2.31E-07	3.36E-05	-0.006873	0.9946
D(GCF(-3))	1.30E-05	3.01E-05	0.430162	0.6719
D(HCF(-1))	1.72E-05	4.39E-05	0.392807	0.6988
D(HCF(-3))	0.000101	4.03E-05	-2.505094	0.0215

ECM(-1)	-4.160590	6.212166	-0.669749	0.5111
R-squared	0.539748	Mean dependent var		2.260667
Adjusted R-squared	0.477752	S.D. dependent var		4.118113
S.E. of regression	4.134045	Akaike info criterion		5.952965
Sum squared resid	324.7162	Schwarz criterion		6.466737
Log likelihood	-78.29447	Hannan-Quinn criter.		6.117325
F-statistic	6.977691	Durbin-Watson stat		1.88634
Prob(F-statistic)	0.002954			

Source: *Computed Result (E-view 7.1)*

CONCLUSION AND RECOMMENDATIONS

Inadequate funding of the agricultural sector has been identified by several experts as an obstacle to increased forestry output in Nigeria. However, from a nominal point of view, it is evident that in Nigeria, government spending on forestry continued to increase over the years while empirical evidence have revealed that the performance of the forestry sector has been inadequate. Table 6 of the model showed that the coefficient of ECM appeared with the right sign and statistically significant at the 5% level. Moreover, the current and lag one forms of the independent variables (GCF and HCF) were positively signed. While the current and lag one forms of the independent variable (NNS) are negatively signed. All these conform to apriority expectation. But for the one period, the independent variables were not statistically significant at 5 percent level. With these results, we accept the null hypotheses of the analysis which state that there is no significant relationship between capital accumulation and forestry production output. In the model the current and lags forms (i.e lag one and two) of the independent variables (GCF and HCF) were positively signed. While the current and lags forms of the independent variable (NNS) are negatively signed except lag one form that is positively signed. But for the one period, the independent variables were not statistically significant at 5 percent level. Table ECM appeared with the right sign but statistically not significant at the 5% level. Meanwhile, the lag one and three forms of the independent variables (HCF) are positively signed. But only the lag three form is statistically significant. Also, the lag one and three forms of the independent variable (GCF) are positively signed but not statistically significant. But for the independent variable (NNS), only the lag one period are statistically not significant while the lag three period is negative and statistically not significant. With these results, we accept the null hypothesis of the model which state that there is no significant relationship between capital accumulation and forestry production output in Nigeria. Meaning that capital accumulation (proxied by net national savings, gross capital formation and human capital formation) alone does not spur forestry output in Nigeria during the period under review. From this, it is obvious that the government has not done much to make capital accumulation impact significantly on forestry production output.

The government should increase funding and encourage investment in human capital development especially in education, health, research and development. This will ensure that the requisite manpower needs in the forestry sector will be available

Government policies on capital Investment in the forestry sector should be increased and monitored to ensure that the target groups use the funds for the development of the forestry sector.

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